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From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

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NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing *(day/month/year)*	13.04.2004
Applicant's or agent's file reference: 273/02104	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IL 02/00018	08.01.2002	08.01.2002

Applicant: BIO SCAN LTD. ET AL.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the International preliminary examining authority:

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 273/02104	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/IL 02/00018	International filing date *(day/month/year)* 08.01.2002	Priority date *(day/month/year)* 08.01.2002
International Patent Classification (IPC) or both national classification and IPC A61B18/26		
Applicant BIO SCAN LTD. ET AL.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 13 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☒ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
04.08.2003	13.04.2004
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Mayer-Martenson, E Telephone No. +31 70 340-4401

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IL 02/00018

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-33 as originally filed

Claims, Numbers

1-125 received on 22.03.2004 with letter of 22.03.2004

Drawings, Sheets

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

   ☐ the entire international application,

   ☒ claims Nos. 60-102,110-125

   because:

   ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

   ☒ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. 60-102,110-125 are so unclear that no meaningful opinion could be formed *(specify)*:

   see separate sheet

   ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

   ☐ no international search report has been established for the said claims Nos.

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

   ☐ the written form has not been furnished or does not comply with the Standard.

   ☐ the computer readable form has not been furnished or does not comply with the Standard.

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees, the applicant has:

   ☐ restricted the claims.

   ☒ paid additional fees.

   ☐ paid additional fees under protest.

   ☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

☐ complied with.

☒ not complied with for the following reasons:

see separate sheet

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

☒ all parts.

☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-59,103-109
	No:	Claims	102
Inventive step (IS)	Yes:	Claims	1-59,103-109
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-59,102-109
	No:	Claims	

2. Citations and explanations

see separate sheet

Reference is made to the following documents:

D1: DE 24 12 690 A (WOLF GMBH RICHARD) 17 October 1974 (1974-10-17)
D2: US-A-5 944 687 (DA SILVA LUIZ ET AL) 31 August 1999 (1999-08-31) cited in the application
D3: WO 00 33913 A (STRATEGIC BUSINESS DEV INC) 15 June 2000 (2000-06-15)

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The various definitions of the subject-matter given in the plurality of dependent claims, each reciting a different combination of limitations expressed at different levels of generalizations and largely repetitive, are such that the claims as a whole are not clear and concise. The requirements of Article 6 PCT, therefore, are not met.

Consequently, the different combinations of features recited in the plurality of dependent claims do not allow to correctly identify "the claimed invention" on which an opinion in the sense of Article 33.1 PCT should be based.

Therefore, this presentation of a number of dependent claims makes it difficult, if at all possible, to determine the matter for which protection is sought and places an undue burden to others seeking to establish the extent of monopoly requested.

For this reason a full substantive preliminary examination cannot be carried out.

Re Item IV

Non-unity of invention

IV.1 The International Preliminary Examination Authority (IPEA) shares the opinion of the search authority as to non-unity of invention.

IV.1.1 The separate inventions/groups of invention are:

1. Claims 1-101,110-125:
   accoustic generator with selective absorbing region

2. Claims 102-109
   generator with a plurality of waveguides comprising each an absorber

A generator including a source of electromagnetic radiation and a waveguide comprising a

wavelength selectively absorbing region is known from prior art document DE2412690. Claim 1 further discloses that the source generates radiation having a plurality of wavelengths therefore defining a special technical feature for the first invention.

Independent claims 60,87,88,110,117,120 and subclaims have been grouped in the first invention.

I.3. Claim 102 describes a generator with a plurality of waveguides each defining an absorbing region therefore defining a special technical feature for the second invention.

I.4 The special technical features defined for each invention are neither the same nor coresponding as they also solve different problems, namely:

1.) irradiation of the target with ultrasound and electromagnetic radiation
2.) shaping the ultrasonic field by timing of the electromagnetic radiation in each waveguide;

Therefore the requirement of unity of invention (Rule 13.1 PCT) is not fulfilled.

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

V.1. First invention (claims 1,60,87,88,110,117,120)

V.1.1 Clarity

The large amount of independent claims renders the subject matter of the first invention so unclear and inconcise that a proper assessment concerning novelty and inventive step of the invention is difficult if not impossible (Article 6 PCT) (see also under Item III above).
In the following the examination has been restricted to independendent claim 1 and it's dependent claims.

V.1.2 Claim 1

Document D1, which is considered to represent the most relevant state of the art, discloses

an ultrasonic generator, comprising:
a source of electromagnetic radiation (1)*;*
an electromagnetic waveguide (2) *coupled to the source; and*
at least one absorbing region (3) *in said waveguide that converts incident electromagnetic radiation from the source into ultrasonic waves* (cf. p.6. par. 2; fig. 1).

Claim 1 differs from D1 in that the source of electromagnetic radiation *generates radiation having a plurality of different wavelengths* and that the absorbing region converts incident radiation *of fewer than all the plurality of generated wavelengths* into ultrasonic waves.

Claim 1 is therefore new.

D1 does not disclose or fairly suggest the use of a plurality of wavelengths, some of them not being absorbed by the absorbing region. Also no other document discloses this feature. Therefore claim 1 is new and inventive.

V.1.3 Dependent claims

Since the subject matter of claim 1 is new and inventive, also the subject matter of claims 2-59 is new and inventive.

V.2 Second invention (claims 102-109)

V.2.1 Novelty

The present application does not meet the requirements of Article 33(2) PCT, because the subject matter of claim 102 is not new.

Document D3 discloses

An acoustic generator comprising
a source of electromagnetic radiation; and
a plurality of waveguides coupled to said source, each waveguide defining an absorbing region that converts said radiation into an ultrasonic acoustic field,
wherein said source irradiates at least two of said plurality of waveguides at the same time such that fields of said two waveguides interact (cf. p.11, l.24-35; p.14, l.34 - p.15, l.6).

Hence the subject matter of claim 102 is not new.

V.2.2 Dependent claims

The subject matter of the dependent claims 103-109 is neither disclosed in D3 or rendered obvious.

CLAIMS

1. An ultrasonic generator, comprising:

a source of electro-magnetic radiation that generates radiation having a plurality of different wavelengths;

an electromagnetic waveguide coupled to the source; and

at least one absorbing region in said waveguide that converts incident electromagnetic radiation of fewer than all the plurality of generated wavelengths from the source into ultrasonic waves.

2. A generator according to claim 1, wherein at least one of the wavelengths not converted by the absorbing region into electromagnetic radiation is used for light illumination.

3. A generator according to claim 1 or claim 2, wherein said waveguide is formed into a guidewire.

4. A generator according to any of claims 1-3, wherein said generator is adapted to be inserted into a body.

5. A generator according to any of claims 1-4, wherein said waveguide comprises an optical fiber.

6. A generator according to claim 5, wherein said fiber includes a non-acoustic optical fiber sensor.

7. A generator according to claim 5, wherein said absorbing region comprises a segment that is added to said fiber.

8. A generator according to claim 5, wherein said absorbing region comprises a doping of a core or damage to the core of said fiber.

9. A generator according to any of claims 1-8, wherein said absorbing region is optically controllable to change at least one of said criterion and its absorption.

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10. A generator according to any of claims 1-9, wherein said source comprises a laser source.

11. A generator according to any of claims 1-10, wherein said source comprises a coupler for a laser source.

12. A generator according to any of claims 1-10, wherein said source comprises a spectral filter.

13. A generator according to any of claims 1-12, wherein said at least one absorbing region comprises at least two absorbing regions.

14. A generator according to any of claims 1-12, wherein said at least one absorbing region comprises at least three absorbing regions.

15. A generator according to any of claims 1-12, wherein said at least one absorbing region comprises at least four absorbing regions.

16. A generator according to claim 13, wherein said at least two regions have same absorbing characteristics.

17. A generator according to claim 13, wherein said at least two regions have different absorbing characteristics.

18. A generator according to any of claims 13-17, wherein said at least two regions have at least one different absorption selectivity criterion.

19. A generator according to any of claims 13-17, wherein said at least two regions have same selectivity.

20. A generator according to any of claims 13-17, wherein the absorption properties of said at least two regions are adjusted so as to achieve a desired effect on said ultrasonic waves.

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21. A generator according to any of claims 13-17, wherein said at least two regions are spaced apart to achieve a desired effect on said ultrasonic waves.

22. A generator according to claim 21, wherein said effect is selection of a wavelength spectrum.

23. A generator according to claim 20 or claim 21, wherein said effect is a selection of a spatial field distribution.

24. A generator according to claim 21, wherein said effect is a selection of an acoustic envelope shape.

25. A generator according to any of claims 1-24, wherein said absorbing region is a volume absorber that absorbs said radiation along its length in a direction of propagation of said radiation.

26. A generator according to claim 25, wherein said absorbing region has axially uniform absorption characteristics, along the axis of said waveguide.

27. A generator according to claim 25, wherein said absorbing region has axially non-uniform absorption characteristics, along the axis of said waveguide.

28. A generator according to claim 27, wherein said absorbing region has stepped absorption characteristics, along the axis of said waveguide.

29. A generator according to any of claims 1-28, wherein said absorbing region is a solid absorber.

30. A generator according to any of claims 1-28, wherein said absorbing region is a fluid absorber.

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31. A generator according to any of claims 1-30, wherein said waveguide comprises an acousto-optical modulator portion that modulates light waves responsive to an acoustic field.

32. A generator according to claim 31, comprising an optical detector coupled to said waveguide which generates a signal responsive to said acoustic field.

33. A generator according to claim 32, wherein said optical detector detects radiation that passes through said absorbing region unabsorbed.

34. A generator according to claim 32 or claim 33, comprising a signal processor that reconstructs an image from said signal.

35. A generator according to claim 34, wherein said image is a one dimensional image.

36. A generator according to claim 34, wherein said image is a two dimensional image.

37. A generator according to claim 32 or claim 33, comprising a signal processor operative to reconstruct a tissue characterization from said signal.

38. A generator according to claim 32 or claim 33, comprising a signal processor operative to reconstruct a distance from said signal.

39. A generator according to any of claims 1-38, wherein said source provides at least one wavelength having a high power level that passes through said absorbing region substantially unabsorbed.

40. A generator according to any of claims 1-39, wherein the source generates radiation having at least three different wavelengths.

41. A generator according to any of claims 1-39, wherein the source generates radiation having at least four different wavelengths.

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42. A generator according to any of claims 1-41, comprising a plurality of waveguides arranged in a phased-array and a controller that controls said source to activate said array as a phased-array.

43. A generator according to any of claims 1-41, wherein said ultrasonic wave is operative to be steered in space by said generator without moving the absorbing region.

44. A generator according to any of claims 1-41, wherein said generator comprises only a single waveguide.

45. A generator according to any of claims 1-44, comprising an ultrasonic absorber, which spatially shapes said ultrasonic waves.

46. A generator according to any of claims 1-45, comprising a controller operative to control said source.

47. A generator according to claim 46, wherein said controller synchronizes an operation of said generator with a separate treatment device.

48. A generator according to claim 46 or 47, wherein said controller synchronizes an operation of said generator with a separate imaging device.

49. A generator according to claim 46 or 47, wherein said controller reads out optical signals received via said waveguide.

50. A generator according to any of the preceding claims, wherein the at least one absorbing region comprises a volumetric absorption region which absorbs radiation along its length in a direction of propagation of said radiation.

51. A generator according to claim 50, comprising a reflector for reflecting at least a portion of the light that passes once through said absorber, to pass at least a second time through said absorber.

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52. A generator according to claim 51, comprising a second reflector for reflecting at least a portion of the light that passes twice through said absorber, to pass at least a third time through said absorber.

53. A generator according to any of the preceding claims, wherein a second one of said wavelengths interacts with said waveguide other than at said at least one absorbing region, to generate ultrasound.

54. A generator according to claim 53, wherein said second generated ultrasound has an intensity high enough to attack adjacent plaque in a blood vessel.

55. A generator according to any of the preceding claims, wherein a second one of the wavelengths exits said waveguide at a high enough power to interact with in-vivo biological tissue.

56. A generator according to any of the preceding claims, wherein said waveguide is flexible.

57. A generator according to any of the preceding claims, wherein said waveguide is rigid.

58. A generator according to any of the preceding claims, wherein said waveguide is formed into a catheter.

59. A generator according to any of the preceding claims, wherein the at least one absorbing region converts incident electromagnetic radiation of only a single of the generated wavelengths from the source into ultrasonic waves.

60. An acoustic generator, comprising:

a source of electro-magnetic radiation;

a waveguide coupled to said source; and

at least one volumetric absorbing region defined in said waveguide, which absorbs radiation along its length in a direction of propagation of said radiation,

wherein said absorbing region converts said radiation into an ultrasonic acoustic field.

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61. A generator according to claim 60, wherein said absorber is uniformly absorbing along its length.

62. A generator according to claim 60, wherein said absorber is non-uniformly absorbing along its length.

63. A generator according to claim 62, wherein said non-uniformity is designed to achieve a certain absorption profile.

64. A generator according to claim 63, wherein said absorption profile is designed to achieve a substantially uniform energy deposition along said absorber.

65. A generator according to claim 62, wherein said non-uniformity is stepped, defining a plurality of contiguous uniform sub-regions with different absorbing characteristics.

66. A generator according to claim 62, wherein said non-uniformity is stepped, defining a plurality of non-contiguous uniform sub-regions with different absorbing characteristics.

67. A generator according to any of claims 60-66, comprising a reflector for reflecting at least a portion of the light that passes once through said absorber, to pass at least a second time through said absorber.

68. A generator according to claim 67, comprising a second reflector for reflecting at least a portion of the light that passes twice through said absorber, to pass at least a third time through said absorber.

69. A generator according to claim 67, wherein said second reflector is polarization discriminating and comprising a polarization rotator.

70. A generator according to any of claim 60-69, wherein half a thickness of said absorption area absorbs less than 80% of light absorbed by said absorbing area.

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71. A generator according to any of claim 60-70, wherein said absorbing region has a non-uniform cross-section.

72. A generator according to any of claim 60-70, wherein said absorbing region does not fill a cross-section of said waveguide.

73. A generator according to any of claim 60-70, wherein said waveguide guides substantially all radiation provided in waveguide to said absorbing region.

74. A generator according to claim 73, wherein said guidance comprises guiding said radiation to have a substantially uniform cross-section along said absorbing region.

75. A generator according to any of claim 60-74, wherein said absorbing region selectively absorbs only some of said radiation.

76. A generator according to any of claim 60-75, comprising a plurality of absorbing regions.

77. A generator according to claim 76, wherein said absorbing regions are arranged along an axis of said waveguide.

78. A generator according to claim 76, wherein said absorbing regions are arranged in a trans-axial direction of said waveguide.

79. A generator according to any of claims 76-78, wherein said multiple absorbing regions have same absorption characteristics.

80. A generator according to any of claims 76-79, wherein at least one of said multiple absorbing regions has a different absorption characteristics from another one of said regions.

81. A generator according to any of claims 76-80, wherein at least two of said multiple regions at least partially overlap.

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82. A generator according to any of claims 76-81, wherein at least one of said multiple regions is selectively addressable to control a direction of said ultrasonic waves.

83. A generator according to any of claims 76-81, wherein at least one of said multiple regions is selectively addressable to control a frequency of said ultrasonic waves.

84. A generator according to any of claims 60-83, wherein said waveguide is an optical fiber.

85. A generator according to any of claims 60-84, wherein said absorbing region has sharp boundaries.

86. A generator according to any of claims 60-84, wherein said absorbing region has at least one blurred boundary.

87. A method of designing an ultrasonic generator powered by electromagnetic radiation, comprising:

determining a desired property of a generated ultrasonic wave; and

calculating a spatial absorbing profile of at least one transduction region of said generator to achieve said desired property.

88. A method of designing an ultrasonic generator powered by electromagnetic radiation, comprising:

determining a desired property of a generated ultrasonic wave; and

calculating at least one of a geometric characteristic and a physical characteristic of at least two transduction regions of said generator to achieve said desired property.

89. A method according to claim 88, wherein said geometric characteristic comprises a length of at least one of said regions.

90. A method according to claim 88 or claim 89, wherein said geometric characteristic comprises a spacing between said regions.

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91. A method according to any of claims 88-90, wherein said geometric characteristic comprises a number of said regions.

92. A method according to any of claims 88-91, wherein said physical characteristic comprises an optical density of at least one of regions.

93. A method according to any of claims 88-92, wherein said physical characteristic comprises a uniformity of density of at least one of regions.

94. A method according to any of claims 88-93, wherein said property comprises a characteristic wavelength, for a given driving scheme.

95. A method according to any of claims 88-94, wherein said property comprises a characteristic wavelength power spectra, for a given driving scheme.

96. A method according to any of claims 88-95, wherein said property comprises a spatial propagation profile, for a given driving scheme.

97. A method according to any of claims 88-96, wherein said property comprises a characteristic acoustic envelope for a given driving scheme.

98. A method according to any of claims 88-97, wherein said calculating is performed prior to manufacture of said generator.

99. A method according to any of claims 88-97, wherein said calculating is performed after manufacture and prior to use of said generator.

100. A method according to claim 99, comprising effecting at least one of said characteristics by selecting an irradiation wavelength of said absorbing areas.

101. A method according to claim 99, comprising effecting at least one of said characteristics by optically activating at least one of said absorbing areas.

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102. An acoustic generator, comprising:

a source of electro-magnetic radiation; and

a plurality of waveguides coupled to said source, each waveguide defining an absorbing region that converts said radiation into an ultrasonic acoustic field,

wherein said source irradiates at least two of said plurality of waveguide at a same time such that fields of said two waveguides interact.

103. A generator according to claim 102, comprising a controller, coupled to said source and operative to selcctively control each of said acoustic fields.

104. A generator according to claim 103, wherein said controller sets a relative phase between said two fields.

105. A generator according to any of claims 103-104, wherein said controller sets a relative pulse rate between pulsed light provided in said two waveguides.

106. A generator according to any of claims 103-104, whercin said controller sets a relative pulse phase between pulsed light provided in said two waveguides.

107. A generator according to any of claims 103-106, wherein said controller sets a relative amplitude between said two waveguides.

108. A generator according to any of claims 102-107, wherein said fields interact to obtain a desired propagation direction.

109. A generator according to any of claims 102-108, wherein said fields interact to enhance power in a certain wavelength.

110. An ultrasonic generator, comprising:

a source of electro-magnetic radiation that generates radiation having a plurality of propagating components;

an electromagnetic waveguide; and

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an absorbing region in said waveguide that converts incident electromagnetic radiation into ultrasonic waves, wherein only one of said components interacts with said absorbing region to create ultrasound.

111. A generator according to claim 110, wherein a second one of said components interacts with said waveguide other than at said absorber to generate ultrasound.

112. A generator according to claim 110, wherein said second generated ultrasound has an intensity high enough to attack adjacent plaque in a blood vessel.

113. A generator according to any of claims 110-112, comprising an optical acoustic detector in said waveguide and wherein an additional one of said components interacts with said waveguide to detect an ambient ultrasonic field.

114. A generator according to any of claims 110-113, wherein a second one of said components exits said waveguide at a high enough power to interact with in-vivo biological tissue.

115. A generator according to any of claims 110-114, wherein said different components have different polarizations.

116. A generator according to any of claims 110-114, wherein said different components have different wavelengths.

117. An ultrasonic probe, comprising:

a waveguide having an axis along which electromagnetic radiation propagates and defining an absorber that converts said radiation into forward propagating ultrasound that further propagates in a general direction of said axis; and

an output port that outputs light carries in a same direction as said ultrasound.

118. A probe according to claim 117, wherein said output port is formed in said waveguide.

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119. A probe according to claim 117 or claim 118, comprising a forward looking ultrasonic detector defined in said waveguide.

120. An acoustic generator, comprising:

a source of electro-magnetic radiation;

a waveguide coupled to said source; and

a plurality of spaced apart absorbing regions defined in said waveguide,

wherein each of said absorbing region converts said radiation into an ultrasonic acoustic field.

121. A generator according to any of claims 60-86, 102-116 or 120, wherein said waveguide is flexible.

122. A generator according to any of claims 60-86, 102-116 or 120, wherein said waveguide is rigid.

123. A generator according to any of claims 60-86, 102-116 or 120-122 wherein said waveguide is formed into a guidewire.

124. A generator according to any of claims 60-86, 102-116 or 120-122, wherein said waveguide is formed into a catheter.

125. A generator according to claim 124, wherein said catheter is a balloon catheter.

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